Why We Are Getting Smarter:

A Conjecture

At least since the 19th century, people have been worrying that modern society, by relaxing selective pressure, would result in a gradual decline of innate human abilities. The strong form of the argument was the claim that poorer people, on average, were less able than less poor people but more prolific. A weaker form was the claim that high real incomes, modern medicine, and institutions, public and private, for aiding the disadvantaged, meant that the less able were no longer being weeded out.

While at least the latter form of the argument seems plausible, it is contradicted by a striking empirical fact. Over the period during which IQ's have been measured, the average score has drifted slowly upwards. This is not my field, but I gather from what I have read that no really satisfactory explanation has been found for this phenomenon.

The purpose of this note is to suggest one possible explanation which, so far as I know, has not been discussed in the relevant literature.

The Human Problem

Our species faces a serious problem, inherent in our basic design. Human beings have large brains, presumably because they contribute to higher intelligence and thus greater reproductive success. Large brains require large skulls. The skull is a rigid object that must pass through the mother's pelvis in the process of childbirth; if the fit is too tight, the process sometimes fails, resulting in the death of mother and infant.

One possible solution is to widen the female pelvis. But a wider pelvis results in a skeleton less well designed for running, hence a greater risk of being eaten by predators. Another possible solution is for the child to be born sooner, hence smaller. But the earlier the child is born, the harder it is to keep it alive and the longer the period when it is helpless and so requires extensive adult assistance.

The solution, as anyone familiar with the mathematics of constrained maximization would expect, is a compromise, pushing on all margins. Human infants are born premature by the standards of other mammals that produce single offspring. Human females have wider pelvises than males and, on average, run less well. Humans under natural circumstances suffer a substantial rate of death in childbirth.

Population Equilibrium in a Primitive Society

Consider what this means for the equilibrium state of a primitive society. On average, the larger an infant's skull, the more likely it is that he and his mother will not survive his birth. So the average genetic skull size (the skull size set by the genes, ignoring the changes over the period of development of the fetus and environmental factors) of children conceived is larger than the average

for children born alive, and the average genetic skull size of women who have not yet had children is larger than the average for women who have had children--because women with genes for producing larger skulled infants, and infants with genes that produce larger skulled infants, are being selectively eliminated by death in childbirth. This equilibrium is maintained because the larger skulled infants who do survive childbirth on average have higher reproductive success than the average infant, bringing the genetic skull size of the next generation conceived back up. Putting it in shorthand, we have a population in which the genotype has larger skulls than the phenotype.

The Effect of Introducing Modern Obstetrics

We now introduce modern obstetrics and essentially eliminate deaths in childbirth in developed societies. The average of the infants who survive childbirth rises to that of infants conceived, so the average skull size, and the average intelligence, rises. The effect is spread out over time as modern obstetrics spreads to a larger and larger fraction of the population.

Finally, consider the situation once coverage of modern obstetrics is essentially complete. The gene frequency of genes for large skulls is still rising in the living population due to greater reproductive success, and it is no longer being pushed back down at each generation due to selective mortality. So the average should continue to rise until some further adverse effect gradually stops the process.

Possible Objections

One obvious objection to this conjecture is that it assumes that larger brains result in greater intelligence, and greater intelligence in greater reproductive success. Is that assumption plausible?

Obviously, intelligence is not simply a function of brain size; for one thing, we know that, across species, larger animals have larger brains even if they are no smarter. Presumably one factor in brain size is that the larger an animal is, the more of it there is for the brain to monitor and control. But that is still consistent with the idea that, holding other factors constant, a larger brain results, in average, on greater intelligence.

So far as the case of humans is concerned, I have no idea what the data show on the relation among brain size, body size, and measures of intelligence. My reason for thinking the assumption plausible is that, without it, it is hard to understand why humans have such large skulls--large enough to produce a serious problem in childbirth for pre-modern societies. A further reason is that brains are expensive organs, biologically speaking--they use a lot of energy. Given the nature of Darwinian evolution, if a human with a smaller skull was just as smart as one with a larger skull, had lower mortality in childbirth, and could survive with less food, skulls would get smaller. Of course, it is possible that large skulls contribute to reproductive success for some reason unrelated to intelligence--but I cannot think of a plausible candidate.

A less obvious objection is that problems in childbirth depend on the cross sectional area of the skull, not its volume, so one would think that, if my argument is correct, human beings would have solved the problem by evolving elongated skulls. I suspect the explanation of why that has not happened has something to do with signal transmission in the brain--that an elongated skull will

have, on average, longer transmission paths--but that is only a guess. The human design does ameliorate the problem somewhat by giving new borns relatively malleable skulls.

Conclusion and Tests

The conclusion of the argument is straightforward--the rise in measured intelligence is a result of the elimination, by modern obstetrics, of the pattern of selective death in childbirth of large skulled infants and their mothers.

How might one test this conclusion? One obvious test is to see whether skull sizes have actually increased, on average, over the past century or so--ideally skull sizes at birth, assuming the data are available. Doing this might be a little tricky, because there are other factors that may be at work. Skull size at birth depends in part on age at birth, and changes in environmental factors such as maternal nutrition might affect that.

A second test, and one likely to be hazardous for the professional health of those making it, would be a statistical examination of the relation between skull size and measured intelligence, controlling for body size--and for other variables that seem to correlate with skull size.

A final test would be to see how the pattern of increase in measured intelligence and/or skull size corresponded to the pattern of introduction of modern obstetrics, across countries.

And, Finally, a Story Idea

There is one solution to the problem I have described which our species has not tried, but other mammals have. Marsupials, such as kangaroos, bear their infants very immature but then transfer them to a pouch outside of the mother's skeleton, where they continue to develop. They thus get the infant through the mother's pelvis when it is still very small.

Imagine a science fiction story in a universe where something, perhaps parallel evolution, has produced mammal-like species on many different planets. One of these species consists of intelligent marsupials. Their biologists have followed out the logic of the problem described earlier in this note, and reached the obvious conclusion: Only marsupials can be intelligent, because only marsupials can continue to evolve bigger brains past the point where the skull of the mature infant is too large to fit through his mother's pelvis.

The story concerns their encounter with humans, and their attempt to explain away the evidence that humans are intelligent and to figure out what the real intelligent (marsupial) species on earth is.

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